



Pittsburgh Corning Corporation  
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**F A C S I M I L E   C O V E R   P A G E**

To:	Sondericker , John	From:	Ken Collier
Fax:		Fax #:	(724) 325-9704
Company:	Brookhaven National Labs	Tel #:	(724) 327-6100

Subject	Argon tank		
Date Sent:	5/28/2008	Pages:	

Dear Mr. Sondericker:

Here is Energy Analysis Report number 14489 that you had requested.

This report was prepared to estimate the thickness of Pittsburgh Corning FOAMGLAS® Insulation required to limit heat gain and surface condensation on liquid argon tanks.

If you have any questions or if we can be of further assistance, please call me or your regional manager Mr. H. C. Mohr at 609/737-9609.

Sincerely,

Kenneth R. Collier  
*FOAMGLAS® Products Technical Services*

cc: C. Mohr  
R. English

*These calculations provided to you at no charge conform to the design criteria which you provided. PCC does not guarantee the final design values indicated by such calculations nor represent that they are free of all errors and shall bear no liability for direct or indirect damages arising out of or in connection with your use of these calculations.*

PITTSBURGH CORNING CORPORATION  
ENERGY ANALYSIS REPORT NUMBER 14489  
28-MAY-08

PREPARED FOR BROOKHAVEN NATIONAL LAB  
REQUESTED BY JOHN SONDERICKER  
TERRITORY REPRESENTATIVE MR. H. C. MOHR  
PHONE NUMBER 609/737-9609

PROBLEM SPECIFICATIONS

THIS REPORT WAS PREPARED TO SHOW THE THICKNESSES OF FOAMGLAS(R) INSULATION REQUIRED TO LIMIT HEAT GAINS AND CONDENSATION FORMATION ON EQUIPMENT OPERATING AT -305 DEG F.

AMBIENT TEMPERATURES OF 70, 75, AND 80 DEG F WERE CONSIDERED WITH A 0 MPH WIND VELOCITY.

A SURFACE EMITTANCE OF 0.4 TYPICAL OF A METAL JACKET WAS USED.

DESCRIPTION OF PIPE PROGRAM 3

FOR COLD PIPES, CYLINDRICAL TANKS, AND FLAT SURFACES IN AIR, PP3 CALCULATES THE MAXIMUM RELATIVE HUMIDITY, ABOVE WHICH MOISTURE CONDENSES ON THE INSULATED SYSTEMS' OUTERMOST SURFACES.

ACTUAL AS WELL AS NOMINAL THICKNESSES OF THE ONE INSULATING MATERIAL ARE SHOWN, ALONG WITH THE EQUIVALENT THICKNESSES OF A FLAT INSULATION.

THIS ALLOWS A REVERSE CALCULATION: GIVEN A RELATIVE HUMIDITY AND AMBIENT TEMPERATURE, THE MINIMUM ACTUAL THICKNESSES OF INSULATION REQUIRED TO PREVENT CONDENSATION ON THE OUTERMOST SURFACES OF THE INSULATED EQUIPMENT ARE SHOWN.

SURFACE TEMPERATURES AND HEAT FLOWS PER UNIT SURFACE AREA ARE SHOWN; AND FOR PIPES AND TANKS, THE HEAT FLOWS PER UNIT LENGTH ARE ALSO SHOWN.

THE RESULTS MAY BE DISPLAYED IN ENGLISH, METRIC, OR SI UNITS AS DESIRED.

FOR ADDITIONAL INFORMATION CONTACT:  
TERRITORY REPRESENTATIVE LISTED ABOVE OR  
MR. KENNETH R. COLLIER (724)327-6100 EXT 607  
PITTSBURGH CORNING CORPORATION  
800 PRESQUE ISLE DRIVE  
PITTSBURGH, PA 15239 U S A

PREPARED BY \_\_\_\_\_ DATE \_\_\_\_\_

THESE CALCULATIONS, PROVIDED TO YOU AT NO CHARGE, CONFORM TO THE DESIGN CRITERIA WHICH YOU PROVIDED. THESE CALCULATIONS ARE BASED ON THE PROPERTIES OF FOAMGLAS(R) INSULATION MANUFACTURED BY PITTSBURGH CORNING AND DO NOT APPLY TO ANY OTHER CELLULAR GLASS INSULATIONS. PCC DOES NOT GUARANTEE THE FINAL DESIGN VALUES INDICATED BY SUCH CALCULATIONS NOR REPRESENT THAT THEY ARE FREE OF ALL ERRORS AND SHALL BEAR NO LIABILITY FOR DIRECT OR INDIRECT DAMAGES ARISING OUT OF OR IN CONNECTION WITH YOUR USE OF THESE CALCULATIONS.

ENGLISH UNITS

INSULATION MATERIAL - FOAMGLAS\*\*

NOMINAL TANK SIZE = 12.67 FEET ACTUAL DIAMETER = 12.67 FEET  
TANK TEMPERATURE = -305.0 DEG F WIND VELOCITY = 0.0 MILES/HOUR EMITTANCE = 0.40

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INSULATION THICKNESS				* AMBIENT TEMP = 70.00 DEG F				* AMBIENT TEMP = 75.00 DEG F				* AMBIENT TEMP = 80.00 DEG F												
INCHES				* SURFACE RELATIVE BTU BTU				* SURFACE RELATIVE BTU BTU				* SURFACE RELATIVE BTU BTU												
NOM	ACTUAL	EQUIV	*	TEMP	HUMIDITY	HR	SQFT	HR	FT	*	TEMP	HUMIDITY	HR	SQFT	HR	FT	*	TEMP	HUMIDITY	HR	SQFT	HR	FT	*
7.0	7.0	7.31	*	56.62	62.52	9.86	428.49	*	61.57	63.02	10.05	436.80	*	66.51	63.52	10.24	445.20							
8.0	8.0	8.41	*	58.15	66.04	8.63	379.46	*	63.10	66.52	8.79	386.81	*	68.05	66.99	8.96	394.24							
9.0	9.0	9.51	*	59.36	68.97	7.66	340.93	*	64.32	69.41	7.81	347.53	*	69.28	69.86	7.96	354.20							
10.0	10.0	10.63	*	60.34	71.43	6.88	309.85	*	65.31	71.86	7.01	315.85	*	70.27	72.28	7.15	321.90							
11.0	11.0	11.76	*	61.16	73.54	6.24	284.25	*	66.13	73.94	6.36	289.75	*	71.10	74.34	6.48	295.30							
12.0	12.0	12.90	*	61.85	75.36	5.70	262.79	*	66.83	75.75	5.81	267.87	*	71.80	76.13	5.92	273.00							
13.0	13.0	14.05	*	62.45	76.96	5.25	244.55	*	67.42	77.32	5.35	249.27	*	72.40	77.68	5.45	254.04							
14.0	14.0	15.22	*	62.96	78.36	4.86	228.84	*	67.94	78.71	4.95	233.26	*	72.92	79.06	5.04	237.72							
15.0	15.0	16.39	*	63.41	79.61	4.52	215.17	*	68.39	79.94	4.60	219.33	*	73.37	80.27	4.69	223.52							
16.0	16.0	17.58	*	63.81	80.72	4.22	203.17	*	68.79	81.04	4.30	207.09	*	73.77	81.36	4.38	211.05							